THE VALUE AND PLACE OF DUODENOCHOLEDOCHOTOMY IN GALL-STONE SURGERY.

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DUODENOCHOLEDOCHOTOMY was devised to accomplish the removal of offending gall-stones in that part of the common duct included within, or adjacent to, the walls of the duodenum, more particularly to remove stones impacted in the diverticulum of Vater. In this class of cases and in neoplasm of the papilla and, more recently, in removal of pancreatic calculi this operation has a distinct place and meets the requirements satisfactorily.

McBurney[1] in 1891 devised and first performed this operation for a stone in the duodenal part of the common duct with recovery of stone and patient. In 1894, without knowledge on his part of McBurney's procedure, Kocher[2] employed the same route. Kehr,[3] independently of Kocher, performed the operation in 1894. Pozzi[4] in 1894 likewise performed the operation successfully. Robson[5] in 1897 did the operation probably for the first time in England. Up to the end of 1899, according to Kocher, the route had been employed twenty times with two deaths. To this number Thienhaus,[6] by collecting 8 cases and contributing his own, added 9. Besides these Robson[7] has reported 13 of his own cases and 1 of Dalziel.[8] Of these some and the one of Moynihan[9] were for pancreatic calculi, alone or with gall-stones. McBurney has done this operation in 11 cases, of which 9 are through his kindness reported for the first time by the author. W. J. Mayo has employed the operation 6 times, 4 times for stone and twice for neoplasm of the papilla. Of these 4 are herewith reported for the first time through his courtesy and 1 only is included in the statistics of Thienhaus. Kehr[10] more recently reports 3 cases, and to these enumerated the author adds another. From this it will appear that without duplication so far as known 33 cases are herewith added to the 29 cases already reported, making a total of 62 cases. Twenty of these, or approximately one-third, were collected by Kocher[11] for the period 1891 to 1900. Since then 41, or more than twice as many, have been done in the last five years, showing that the operation has found its place among established procedures. In view of the impetus of recent advances in pancreatic work the operation will doubtless acquire increased importance and usefulness

Pantaloni[12] discriminates between lithotomia transduodenalis and choledochotomia transduodenalis. The former devised and performed by McBurney consists in approaching the stone in the common duct near the papilla through an incision in the anterior wall of the duodenum and removing the stone by incising the papilla. Collins modified the last step by dilating the papilla and removing the stone. Kocher's[13] operation of choledochotomia transduodenalis consists in immobilizing the stone in the duct between the fingers and after opening the duodenum, cutting directly down upon the stone through the duodeno-duct wall.

The scope of these procedures was originally confined to the removal of offending gall-stones from the lower end of the common duct, and of the series of 62 cases this was the purpose in 57 or approximately 92 per cent. Later it was made to extend to the relief of obstruction from neoplasm of the papilla. This was done in two cases or 3 per cent. More recently removal of pancreatic calculi by this route has been reported. Thus of the five cases of operation for pancreatic calculi collected by Robson and Clarke from the literature and reported by Robson[14] three at least were modified duodenocholedochotomies. Of the indications for the operation the obvious is obstruction from a gall-stone impacted in the diverticulum of Vater, neoplasm or stricture of the papilla, and pancreatic calculi in the diverticulum or at, and adjacent to, the orifice of the ducts of Wirsung and Santorini. Indications of convenience, rather than urgency are obstruction from a stone not actually in the lowest part of the duct but more accessible via the duodenum than from without by virtue of adhesions; and occasions according to Robson,[15] "when the liver is small and the common duct cannot be made to reach the surface, its exposure through the duodenum may be simpler than the ordinary operation of choledochotomy." Zeller[16] cites an interesting case in which he failed at operation to detect a stone in the lower end of the common duct by palpation and found it at autopsy by passing a probe through the papilla. Since then he has practised sounding the end of the duct through the duodenum when the stone is not readily palpated and thinks the danger of infection is greatly overrated. W. J. Mayo[17] regards the operation as incomplete without a supra-duodenal-choledochotomy on the ground that the obstructing stone removed via the duodenum "may not be the largest present, and others may still remain in the duct;" therefore he recommends "the common duct should at the same time be opened, explored, and drained." That this step is necessary or even desirable in all cases does not appear from the records of reported cases in which it was not done. Drainage, of course, in such cases which represent the cumulative effects of chronic obstruction is important for the success of the work, and where the usually small and contracted gall bladder is not available for drainage purposes a supra-duodenal opening into the common duct may be desirable. In the author's case, which is not cited here to prove that drainage is not necessary in most cases, the gall-bladder was removed after tying the cystic duct and no provision was made for drainage beyond that of a dilated common duct orifice which passed bile freely as soon as the obstructing stone was removed. Moreover in regard to the size of the stone would it not usually be possible to recognize a larger stone in a location more favorable for recognition than a smaller one which had been recognized in a less favorable locality? A stone too large to be removed safely via the duodenal route should be removed by the supraduodenal way. Furthermore, duodenocholedochotomy as indicated above is preferred to supra-duodenal-choledochotomy in certain fixed positions of the common duct as from adhesions or a small liver. In suitable cases supplemental supra-duodenal-choledochotomy ensures added thoroughness and effectiveness, especially when the procedure of drawing gauze strips through the duct between the upper incision in the duct and papillary orifice, as practised by Mayo and Kehr, is carried out.

In regard to the special technique incident to duodeno-choledochotomy McBurney [18] lays stress on the following procedure: "In all cases which are not complicated by very deep adhesions involving the common duct and descending portion of the duodenum, it is easy and very desirable after determining the presence of a calculus in the lower part of the duct to pass the left forefinger through the foramen of Winslow to a point behind the calculus. With the finger the lower end of the common duct, the calculus, and the descending portion of the duodenum can be lifted forward so as to bring these parts nearly or quite to the level of the abdominal incision. The duodenum is then incised in its anterior wall for from one inch to one inch and a half, the orifice of the duct (which is usually markedly altered as to the color, etc.) is easily found and enlarged with knife or scissors or forceps, and the stone removed; all of this, and even the suture of the intestinal wound, should be completed without removing for a moment the left forefinger from its supporting position."

In choledochotomia-transduodenalis Kocher [19] advocates suture of the incision in the posterior duodenal wall when one can be sure that the opening of the papilla will not thereby be narrowed. Robson,[20] on the other hand, has found no need as a rule to suture the posterior duodenal wall. As pointed out by Kocher, however, this is only admissible when the incision has been strictly within the wall of the duodenum and does not extend upward, so as to allow the escape of infected bile into the space between the duct and duodenum. The higher the incision, therefore, the greater the need of suture.

The objections to the operation are based on technical difficulties and postoperative danger. The difficulty in finding the papilla is overestimated and is apparently based on dissecting room studies where the absence of pathological guides is probably responsible for erroneous conclusions. In operating in the presence of pathological conditions we have as aids pointing to the position of the papilla first the calculus supported on the left forefinger and second with the duodenum opened the thickening and discolored appearance of the papilla. Those who have actually done the operation regard this difficulty rather fancied than real. The other principal technical difficulty is the depth of the wound. With the means of bringing the parts into the wound described above and aided by Robson's[21] sand-bag under the lower dorsal spaces this objection is largely removed, and certainly does not apply to duodenocholedochotomy any more than to supra- or retroduodenocholedocotomy.

Postoperative dangers are said to be twofold: (1) duodenal fistula threatening starvation, and (2) infection leading to a fatal result. Of the 62 cases on whom the method has been used two have developed fistulæ. Of these, both Robson's[22] cases, one case, No. 288, died three weeks after operation from exhaustion due to difficulty in feeding on account of the duodenal fistula. The other case, No. 431,[23] developed some leakage from the duodenum which ceased after a time. In regard to infection much light has been thrown upon the subject by the vast amount of work done in the upper abdomen. In view of the freedom with which the duodenum, upper bowel, and stomach have been opened, it is clear this danger is not greatly to be apprehended, provided care is used in the work. In surgery of the bile tract, especially common duct stone and more particularly the late stage with stone impacted in the diverticulum of Vater, it is the effect of obstruction and infection on the liver rather than peritonitis that causes death, as brought out by W. J. Mayo.[24]

The mortality of the cases operated on by the method under discussion is briefly as follows: viz., 62 cases of all sorts with 8 deaths give a mortality of 12.6 per cent. Deducting from the number of cases the three pancreatic cases of Robson and the two neoplasm cases of Mayo and subtracting the 3 deaths in these five cases, we have respectively 57 cases and 5 deaths or 8.77 per cent. for the mortality of duodenocholedochotomy in the gall-stone cases. Until comparatively recently, Robson's [25] mortality for choledochotomy was 16.2 per cent., but more recently has been lowered to 5 per cent. Kehr [26] has a mortality of 6.5 per cent. and the Mayo's,[27] 11 plus per cent. It thus appears that the average of early and late duodenocholedochotomies gives a mortality per cent. comparable with the more recent statistics of supra-duodenal-choledochotomy.

In order to determine whether or not there were operative any factors peculiar to duodenocholedochotomy in the 5 deaths in the stone cases, it will be necessary to go behind the returns and ascertain briefly the causes of death. One of McBurney's cases died on the third day after operation, in spite of all efforts to check it, of persistent hæmorrhage from minute vessels associated with deep and long-continued jaundice. The second died of uncontrollable vomiting on the fourth day and at a secondary operation no abnormality or cause of death was demonstrable. These accidents are features of the conditions present at operation regardless of the special form of procedure and therefore are not rightly chargeable to duodenocholedochotomy. Besides the death mentioned above, in which a fistula was conspicuous, Robson [28] has had a death-case, No. 243, following the operation due to a subdiaphragmatic abscess overlooked at both operations. Nothing in connection with the operative field was found post-mortem to be abnormal. Another case died of heart failure from presence of acute dilatation of the stomach, nothing else being found to account for the death. It appears from the records, then, that one death with fistula and one case with temporary fistula may fairly be cited, to the discredit of the operation. In view of this it hardly can be said that duodenocholedochotomy is extra hazardous. It has participated *pari passu* in the benefits of accumulated experience and improved technique which have accrued to this field from the vast amount of work done in the last few years. A point worthy of consideration, too, in comparing supra- and transduodenal mortality, is that other things being equal a stone impacted in the diverticulum or papilla of Vater represents on the average a later period in the disease process, and hence greater danger from local injuries to the parts and systemic effects of chronic jaundice and infection.

The other operations calculated to accomplish the purpose of duodenocholedochotomy are the usual supraduodenal operation and retroduodenal choledochotomy. The former fails to be effective in just the class of cases for which the transduodenal operation was primarily intended, and offers, besides, no real diminution of risk. It is advantageous in some cases to perform both where stones are distributed along the common duct and finish by drawing gauze strips from the upper opening through the duct to sweep it clean. As a substitute for the transduodenal route the operation of retroduodenal-choledochotomy has been proposed and performed. Berg,[29] basing his views on dissecting-room work, has found with Brewer[30] under like conditions difficulty in finding the papilla.

The fallacy of drawing conclusions from comparisons between anatomical and pathological conditions has already been mentioned. Berg also claims the initial though slight danger of immediate peritoneal infection and that of a subsequent duodenal fistula as objections to the transduodenal route. Quervain[31] gives a summary of the work done along this line and reports a case. The first step in this procedure was taken by Lane[32] when he freed the upper part of the duodenum behind for purposes of investigation, but removed the stone by supra-duodenal-choledochotomy. Later, Kocher[33] endeavored to displace the duodenum to one side to reach the posterior wall, but on account of hæmorrhage from the pancreas changed to the transduodenal route. Jeantry[34] reports three cases performed by Monprofit. Some few others have performed operations which seem to have been along this line. After describing his own case, he sums up the situation by saying that the retroduodenal route is indicated in cases in which the duodenum may be freed in a clear, trim (Sauber) way. Where the duodenum, common duct, and pancreas are matted together by adhesions, and one runs the risk, in separating the same, of injuring the walls of the gut, or starting hæmorrhage, in spite of care, one would do better to proceed by the transduodenal route. From a study of the anatomy of the pancreas and its relations to the duodenum and common duct especially as brought out by Robson [35] it would seem clear that this route would frequently on anatomical grounds alone not be available. Furthermore, the difficulty and time involved at the start in freeing the duodenum behind while working, as one must, at the bottom of a deep cavity will hardly appeal to one as advantages compared to the freedom and speed of the transduodenal route with the parts elevated well into the field of operation. Furthermore, additional time will be consumed in any attempt to replace the duodenum in its original position after extraction of the stone. Finally, there is a condition, an instance of which has recently come under the notice of the author, in which neither of these procedures would have been adequate, while Kocher's trans-duodenal-choledochotomy would have answered very well. I refer to a case with a stone the size of an olive low down in the common duct, a gall-bladder the size of a hazel-nut, absolute stenosis of papillary orifice, and a history of jaundice of fifteen months' standing with numerous ague-like attacks of fever, etc. The patient died from capillary and venous hæmorrhage from broken up adhesions and in spite of calcium chloride, etc. Post-mortem, it was clear that (1) retro-duodenal-choledochotomy would have been impracticable from the comprehensive manner in which the head of the pancreas embraced the junction of the common duct with the duodenum; (2) supra-duodenal-choledocotomy would have been but a preliminary step to a secondary choledochoduodenostomy, and (3) Kocher's trans-duodenal-choledochotomy with subsequent anastomoses using the same incision in duct and gut would have accomplished the choledochoduodenostomy in the easiest and quickest way.

A brief account of the author's case is as follows:

E. M. B., female, forty-six years old, had a primary cholecystotomy at my hands, January 10, 1903, whereby seventy-odd stones were removed. The fistula closed in five (5) weeks with an uninterrupted recovery except for slight return of nausea and vomiting, and colicky pains on the eleventh (11) and twenty-third (23) days respectively after operation. April 3, 1903, I was called to see the patient again and found her suffering with a severe attack of biliary colic. This time there was a slight but distinct trace of jaundice. Patient was removed to the hospital and operated on the same day. On opening the abdomen, it was interesting to notice the absence of adhesions except for one small band connecting the fundus of the gall-bladder with the peritoneum of the abdominal wall where it had been sewed at the first operation. Examination showed one small stone in the gall-bladder and another stone in the common duct where the latter passes through the duodenal wall. Several endeavors to pass the stone into the duodenum or up into the free part of the common duct were unsuccessful, although the stone was susceptible of slight movement, ball-valve stone of Fenger. It became clear the simplest and quickest way for removal was by the duodenum. Securing the stone firmly in the fingers of the left hand, and thus establishing a fixed point, the wall of the duodenum was incised on its antero-external aspect. The papilla was easily dilated and the stone removed. I then sounded carefully from below and found no more stones in the common or hepatic ducts, and closed the duodenum after satisfying myself that there was a free flow of bile at the outlet of the common duct. I suspected the gall-bladder of having contributed the offending stone, and having more in the cystic duct besides the one readily felt at the fundus. I concluded, in view of its contracted and thickened walls and the stones to remove it. Tying the cystic duct where it joins the hepatic, I dissected the mass from the liver. The slight hæmorrhage was controlled by gauze packing, while gauze drains were placed to the wound in the duodenum and stump of the cystic duct. After four days of rectal feeding oral feeding was begun. The dressing was done the fourth day for the first time, and the wound healed kindly and closed the thirty-fourth (34) day. On the thirtieth (30) day after operation the patient menstruated, and during the menstrual period suffered with vertigo, headache, nausea, and vomiting. The vomitus contained bile, showing the duct to be patent. Now, more than two (2) years later, patient reports herself as well and free from symptoms. On examination the bladder and cystic were found to contain many small stones, those in the duct being so distributed in folds and pockets as to obliterate the lumen of the duct.

Summing up the points for and against the transduodenal route it will be convenient to consider the question of neoplasm of the papilla and pancreatic calculi as well as gall-stone for the reason that a fine discrimination in diagnosis is often impossible in this class of cases.

(1) In favor of duodenocholedochotomy for gall-stones in the lower end of the common duct are (*a*) the avoidance of drainage in some cases where one would not otherwise wish to sew up the wound in the duct and close the abdomen; (*b*) the greater ease in sewing the duodenal than the duct incision by virtue of size and proximity of the former; (*c*) uniformly kindly healing of intestinal wounds; (*d*) easy and natural access to common duct; (*e*) ease and benefit of dilatation of papillary orifice in ensuring better drainage of bile and detritus; (*f*) duct may be safely incised for half an inch in extracting stone or in enlarging the orifice for drainage. Against the procedure has been raised the common prejudice against opening gut in general, the fear of fistula which occurred in but two out of sixty-two cases, and the dread of infection which, as indicated above, has been vastly overrated in regard to the upper half of the intestines.

(2) In neoplasm of the papilla this route is clearly indicated for diagnosis and treatment where the growth is amenable to local treatment and the gall-bladder cannot be used for anastomosis or drainage.

(3) In total stenosis of the papillary orifice, whether from neoplasm or trauma of stones, a choledochoduodenostomy could be done with the incision employed in duodenocholodochotomy, where the anastomosis could be made low down in the common duct.

(4) In pancreatic stone, duodeno-pancreo-lithotomy is an

established procedure and for good anatomical reason is the method of election.

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